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(54) IMPROVEMENTS IN OR RELATING TO ELECTROFUSION COUPLERS

VERBESSERUNGEN IN ZUSAMMENHANG MIT ELEKTROSCHWEISSMUFFEN

PERFECTIONNEMENTS SE RAPPORTANT A DES DISPOSITIFS DE COUPLAGE PAR
ELECTROFUSION

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Description

THIS INVENTION relates to electrofusion couplers or welding muffs which are used for connecting lengths of plastics pipe end to end in manner known *per se*. Such an electrofusion coupler is disclosed, for example, in GB2090558.

In manufacture of the electrofusion coupler of GB2090558, a tubular plastics shell or preform is first produced by injection moulding, the preform having upstanding integral studs. An electrical resistance heating wire is then secured to one of these studs on the preform, is wound in a number of turns around the preform from that stud to the other stud and is secured to that stud. The wire is secured to each stud by looping the wire around the stud and over the free end of the stud. A terminal shell or cap is subsequently forced over each stud to make good electrical contact with the wire looped around the stud. The wound preform is then placed in an injection mould, to form the core of the mould, and an outer layer of thermoplastics material is moulded around the wound preform. EP-A-0243062 and EP-A-0260014 disclose also a method of manufacturing heat-weldable thermoplastic fittings and apparatus for carrying out the method.

The present invention, however, relates to a method of manufacturing an electrofusion coupler which dispenses with the need for making a thermoplastics preform to carry the heating winding and in which the heating wire is wound directly on a mould core or mandrel from which the finished electrofusion coupler is eventually stripped. The invention also relates to apparatus for carrying out the method and to an electrofusion coupler produced by the method or using the apparatus.

According to one aspect of the invention, there is provided a method of forming an electrofusion coupler as disclosed in claim 1.

According to another aspect of the invention, there is provided an apparatus for use in carrying out the above method as disclosed in claim 3.

An embodiment of the invention is described below by way of example with reference to the accompanying drawings, in which:-

FIGURE 1 is a schematic fragmentary view in section along a mandrel or core of an apparatus embodying the invention,

FIGURE 2 is a schematic perspective view of the mandrel of Figure 1 with an electrical heating winding thereon,

FIGURE 3 is a schematic exploded perspective view showing part of a terminal support of the apparatus, in conjunction with a length of resistance heating wire and a terminal pin,

FIGURE 4 is a view, in section along the axis of the

terminal support, showing the position after the terminal pin has been driven into the terminal support and formed around the wire,

FIGURE 5 is a perspective view, partly in phantom, corresponding to Figure 4, and

FIGURE 6 is a fragmentary view of an electrofusion coupler or welding muff formed using the apparatus of Figures 1 to 5 still on the mandrel or core, the view being a view in section along the central axis of the welding muff, in a plane containing one of the terminal pins.

Referring the drawings, there is indicated at 10 a mould core or mandrel for an electrofusion coupler or welding muff. In manufacture of an electrofusion coupler or welding muff by the method of the present invention, the heating wire is wound directly on a mould core or mandrel, which is then placed in an injection mould and the thermoplastics body of the electrofusion coupler is moulded around the mandrel and the winding, after which the mould is opened and the mandrel withdrawn leaving the winding supported by the plastics material on the interior surface of the tubular plastics body of the welding muff or electrofusion coupler.

Referring to the drawings, Figure 1 shows, at 10, a generally cylindrical mould core or mandrel for an electrofusion coupler or welding muff. The core or mandrel 10 has adjacent opposite ends thereof respective radial bores 12 which receive respective terminal supports 14 each in the form of a generally cylindrical rod or post slidable within its radial bore under the control of actuating means 15, indicated schematically. The actuating means may, for example, be operated by rotation, or longitudinal movement, relative to the core 10, of a central longitudinal rod 16. Details of the actuating means are not given here, but the man skilled in the art will readily be able to propose mechanisms which will produce the desired movement of the terminal supports 14 as described below. By way of example, the rod 16 might take the form of a worm or rack cooperating with pinions secured to screws engaged in screwthreaded bores provided in the lower ends of supports 14 and extending along the axes of supports 14, the supports 14 being non-rotatable in their bores 12 so that rotation of such screws causes retraction or extension of the supports 14.

As shown in Figure 2, in the first stage in the manufacture of an electrofusion coupler, an electrical resistance heating wire 20 is wound around the mandrel or core 10 from one terminal support 14 to the other in a number of helical turns. As shown in Figure 3, in which the radially outer end part of a terminal support 14, i.e. the part which is radially outermost with respect to the central longitudinal axis of the mandrel, is shown in perspective, and in Figure 4, in which the same part is shown in section along the axis of the terminal support,

a cylindrical blind bore 22 extends axially into the terminal support and terminates in a hemispherical inner end 24. The bore 22 is intersected by a transverse diametral slot 26 which extends from the free end of the terminal holder 14 along the axis of the terminal holder, but which stops short of the end 24 of bore 22. The slot 26 is of a width to receive the wire 20 as a close fit.

In winding the mandrel with electrical resistance heating wire, the wire is laid in the slot 26 so as to extend across the bore 22 and a terminal pin 30, of the form shown in Figure 3, is inserted into bore 22 from the open end thereof and is driven against the inner end 24 of the bore 22. As shown in Figure 4, the entrance to bore 22 is flared to facilitate entry of the pin 30.

The pin 30, which is of malleable metal such as copper or brass, is generally cylindrical with a diameter corresponding with that of the bore 22, but has at the end thereof which is inserted in the bore 22 a diametral slot 32 of substantially the same width as the slot 26. The pin 30 is inserted into bore 22 with an orientation such that, as it reaches the bottom of bore 22, the heating wire 20 which extends across the terminal support 14 in the slot 26, enters the slot 32. The terminal pin 30 is driven axially forcibly into the support 14 so that the part-spherical end surface 24 of the bore 22 deforms the parts of the end portion of pin 30 on either side of the slot 32 and thus on either side of wire 20, towards one another, whereby the wire 20 is gripped firmly by said parts of the pin 30. The end of slot 32 is preferably rounded as shown in Figure 3 and the depth of the slot 32 is such that when the step of driving the pin 30 fully into the support 14 has been completed, the wire is firmly engaged by the material of the pin around most of the periphery of the wire as shown in Figure 4. Figure 5 is a perspective view corresponding to Figure 4. It will be appreciated from the above that the terminal supports 14 act as forming tools or dies with respect to the terminal pins 30.

The orientation of each slot 26 relative to the mandrel 10 is such that the wire extended through the slot 26 lies at substantially the pitch angle of the intended helical winding of the wire on the mandrel. The mandrel is wound automatically by winding equipment known *per se*, for example by rotating the mandrel about its axis whilst traversing a winding head from which the wire is supplied axially with respect to the wire, from an appropriate wire source, such as a rotatably mounted reel of such wire (not shown) the apparatus being so arranged that the wire is laid automatically into the slot 26 as winding proceeds. The pin 30 with its slot 32 appropriately oriented is driven into the bore 22 in the respective support 14 shortly after the wire has been laid in the slot 26 in the support 14 and the pin is thereafter held in place in the support by the wire 20. After the wire 20 has been thus secured in a first one of the terminal supports 14, winding of the wire 20 on the mandrel proceeds until the wire is laid in the slot 26 of the other terminal support 14, after which a terminal pin 30

is driven into the second terminal support in just the same way as described in relation to the first and subsequently the wire is cut on the side remote from the first terminal support for example at the location indicated in "X" in Figure 2. It will be appreciated that the winding equipment typically includes means for gripping the wire at a location upstream of the position at which it is severed after the preceding winding and for retaining such grip on the wire whilst it is extended across the slot 26 of the first terminal support 14 in preparation for securing the pin 32 in that terminal support 14 in readiness for the next winding, and thereafter releasing such grip to allow winding of the wire on the mandrel. The wire is wound on the mandrel under appropriate tension and in held in such tension by the terminal pins 13 and terminal supports. After winding the mandrel with resistance wire, securing the wire by means of the terminal pins 30, and cutting the wire, all as described, the wound mandrel is placed in an injection mould, to form the core of the mould, and molten thermoplastics material is moulded around the core, the wire winding, terminal pins 30 and terminal supports 14.

When the thermoplastics material has solidified, the mould is opened, and the supports 14 are retracted radially inwardly of the mandrel until they lie fully within the cylindrical envelope defined by the mandrel surface. The supports 14 are thus extracted fully from the moulded plastics material. The outer periphery of each terminal support 14 may be tapered or relieved as illustrated to facilitate radially inward extraction of the terminal supports from the plastics of the moulded welding muff. The terminal pins 30, since they are surrounded, in intermediate regions thereof, by the thermoplastics material, are gripped thereby and therefore remain in their original positions relative to the mandrel surface when the mandrel supports 14 are retracted into the mandrel 10. The fragmentary axial section view of Figure 6 illustrates this position. It will be noted that a recess 40 is left in the interior of the plastics sleeve by the retraction of the support 14 and that the inner end of the terminal pin 30 extends into the recess (which recess, of course, is traversed by the wire 20 passing through the inner end of pin 30). As already indicated, an intermediate portion of the pin 30 is surrounded by the plastics material 42, whilst a radially outer (relative to the axis of the mandrel 10 and of the welding muff) part of the pin 30 is exposed within a recess 44 moulded in the outside of the welding muff, for engagement with an electrical contact when the welding muff is to be used.

The retraction of the supports 14 below the level of the peripheral surface of the mandrel makes it possible to withdraw the mandrel axially from the finished welding muff. When the molten thermoplastics material is injected into the mould, it surrounds a major part of the circumference of the heating wire in those regions of the wire which lie against the mandrel surface and consequently, after the plastics has solidified and the welding

muff has been de-moulded and the mandrel 10 withdrawn, the plastics material holds the heating wire in place at the internal surface of the welding muff. The location of the heating wire directly adjacent the inner surface of the welding muff, and thus directly adjacent the outer surface of any inserted pipe end of complementary size is very favourable to efficient and reliable welding of the muff to inserted pipe ends.

After the mandrel has been withdrawn from the moulded welding muff, the terminal supports 14 are once again extended outwardly from the mandrel 10 into the positions shown in Figure 1 so that the mandrel 10 is ready to receive a further winding to begin manufacture of a further welding muff.

It will be appreciated that whilst the mandrel 10 has been referred to as a unitary member, it could be made in two parts meeting in the middle of the welding muff moulded therearound, with a respective terminal holder 14 carried by each of the two parts of the mandrel and with the two parts being finally separated from the moulded welding muff axially in opposite directions.

Claims

1. A method of forming an electrofusion coupler, comprising providing a mandrel (10) having at spaced apart locations therealong first and second terminal holders (14) which can be retracted into the mandrel (10) inwardly of the peripheral surface thereof, and can be extended outwardly from the peripheral surface thereof, the method including the steps of providing a continuous length of electrical resistance heating wire (20), mounting a first terminal (30) in the first said terminal holder (14) and securing the first terminal (30) to said wire, winding the wire around the mandrel (10) from said first terminal (30) and said first terminal holder (14) for a plurality of turns, mounting a second terminal (30) in the second terminal holder (14) and securing the second terminal (30) to the wire, with the wire being maintained in tension between said first and second terminals (30), subsequently cutting the wire extending beyond said second terminal (30), moulding around the wound mandrel (10) and the terminals (30), supported by said terminal supports (14), a sleeve (42) of thermoplastics material, leaving portions of the terminals (30) exposed on the exterior of the sleeve (42), allowing the thermoplastics material to solidify, retracting the terminal holders (14) within the mandrel (10) leaving the terminals (30) supported by the plastics material, and withdrawing the mandrel (10) axially from the sleeve (42) leaving the winding and terminals supported by the plastics sleeve, characterised in that each said terminal (30) has an end thereof provided with a slot (32) to receive said wire (20), and each said terminal holder (14) forms an anvil or die member providing, extending into an outer end thereof, a recess (22) to receive said end of such a terminal (30), the terminal holder (14) having a slot (26) disposed to receive said wire (20) extended across the terminal holder (14) and extended through said slot (32) in a said terminal (30) engaged in said recess (22), the terminals (30) being made of malleable metal and wherein the step of mounting each said terminal in the respective terminal holder and securing the terminal to the wire comprises extending the wire (20) across the terminal holder (14) so that it extends through said slot (26) therein, inserting the terminal (30) into said recess (22) in the terminal holder (14) so that said slot (32) in the terminal holder (14) receives the wire (20) extending across the terminal holder (24), and driving the terminal (30) against the terminal holder (14) to deform the material of the terminal (30) around the wire (20) and thereby grip the wire (20) firmly.
2. The method of claim 1 wherein each said terminal (30) takes the form of a pin having said slot (32), to receive the wire (20), extending longitudinally from a free end thereof and the bottom of said recess (22) in the terminal holder (14) is provided with forming surfaces (24) adapted to engage the portions of said free end of the pin on either side of said slot, below the level of the bottom of the transverse slot (26) in the terminal support (14), and to force said portions of the terminal pin towards one another when the pin (30) is driven longitudinally into the terminal support (14), thereby to cause said portions to deform about the wire (20) extending through said slot (32) in the pin and to grip the wire (20).
3. Apparatus for use in carrying out the method of claim 1 comprising a mandrel (10) having at spaced-apart locations therealong first and second terminal holders (14), means (15, 16) for moving said terminal holders (14) between positions in which they are retracted within the mandrel surface and positions in which they project from the mandrel surface, means for winding electrical heating wire around the mandrel from one said terminal support to another, said terminal supports (14) being adapted to hold terminals (30) secured to said heating wire (20) and thereby maintain the wire in tension between the terminal holders (14), means for cutting the wire (20) at a position adjacent one said terminal holder (14) on the side thereof remote from the other and means for moulding around the mandrel (10), said terminals (30) and the projecting portions of said terminal supports (14), a sleeve of thermoplastics material, characterised in that said terminal supports (14) are in the form of posts each having a recess (22) extending into the post from its outer end and a transverse slot (26) extending across the post and

across the recess (22) in the post from said free end of the post, the slot (22) terminating at a position located outwardly of the inner end (24) of said recess (22), and wherein the inner end (24) of said recess is provided with forming surfaces adapted to deform, towards the plane of said slot (26), respective portions of the end, complementary with said recess (22) and inserted in said recess (22), of a said terminal (30) when the latter is driven into said terminal holder (14).

4. An electrofusion coupler formed by the method of claims 1 or 2 or using the apparatus of claim 3.

Patentansprüche

1. Ein Verfahren zum Formen einer Elektroschweißmuffe, das umfaßt: Bereitstellen eines Dorns (10) mit an voneinander beabstandeten Orten befindlichen ersten und zweiten Anschlußhaltern (14), die nach innen von der Umfangsfläche in den Dorn (10) hineingezogen werden können und von der Umfangsfläche desselben nach außen herausgezogen werden können, wobei das Verfahren die Schritte einschließt: Bereitstellen einer kontinuierlichen Länge eines Widerstandsheizdrahtes (20), Befestigen eines ersten Anschlusses (30) in dem ersten Anschlußhalter (14) und Sichern des ersten Anschlusses (30) an dem Draht, Wickeln des Drahtes um den Dorn (10) von dem ersten Anschluß (30) und dem ersten Anschlußhalter (14) um mehrere Umdrehungen, befestigen eines zweiten Anschlusses (30) in dem zweiten Anschlußhalter (14) und Sichern des zweiten Anschlusses (30) an dem Draht, wobei der Draht zwischen den ersten und zweiten Anschlüssen (30) in Spannung gehalten wird, nachfolgendes Abschneiden des Drahtes, der sich über den zweiten Anschluß (30) hinaus erstreckt, Formen einer Hülle (42) aus thermoplastischem Material um den umwickelten Dorn (10) und die Anschlüsse (30), die von den Anschlußhaltern (14) gehalten werden, Freiliegenlassen von Bereichen der Anschlüsse (30) auf der Außenseite der Hülle (42), Verfestigenlassen des thermoplastischen Materials, Hineinziehen der Anschlußhalter (14) in den Dorn (10), wobei die Anschlüsse (30) von dem Kunststoffmaterial gehalten bleiben, und axiales Herausziehen des Dorns (10) aus der Hülle (42), wobei die Wicklung und Anschlüsse von der Kunststoffhülle gehalten bleiben, dadurch gekennzeichnet, daß jeder Anschluß (30) ein Ende aufweist, das mit einem Schlitz (32) zum Aufnehmen des Drahtes (20) versehen ist, und jeder Anschlußhalter (14) ein Anschlag- oder Formelement formt, das eine sich in ein äußeres Ende desselben erstreckende Ausnehmung (22) zum Aufnehmen des Endes eines derartigen Anschlusses (30) bereitstellt, wobei der Anschlußhalter (14)

einen Schlitz (26) aufweist, der angeordnet ist, um den sich quer über den Anschlußhalter (14) und durch den Schlitz (32) in dem Anschluß (30), der in der Ausnehmung (22) eingegriffen ist, erstreckenden Draht (20) aufzunehmen, wobei die Anschlüsse (30) aus einem unter Druck verformbaren Metall hergestellt sind und worin der Schritt des Befestigens jedes Anschlusses in dem jeweiligen Anschlußhalter und Sichern des Anschlusses an dem Draht das Ausbreiten des Drahtes (20) quer über den Anschlußhalter (14) derart, daß er sich durch den Schlitz (26) darin erstreckt, Einsetzen des Anschlusses (30) in die Ausnehmung (22) in dem Anschlußhalter (14) derart, daß der Schlitz (32) in dem Anschlußhalter (14) den sich quer über den Anschlußhalter (24) erstreckenden Draht (20) aufnimmt, und Treiben des Anschlusses (30) gegen den Anschlußhalter (14) zum Verformen des Materials des Anschlusses (30) um den Draht (20) und dadurch festen Greifen des Drahtes (20) umfaßt.

2. Das Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß jeder Anschluß (30) die Form eines Stiftes mit dem Schlitz (32) zum Aufnehmen des Drahtes (20), der sich in Längsrichtung von einem freien Ende desselben erstreckt, annimmt und die Unterseite der Ausnehmung (22) in dem Anschlußhalter (14) mit Formflächen (24) versehen ist, die gestaltet sind, um die Bereiche des freien Endes des Stiftes auf jeder Seite des Schlitzes unter der Höhe der Unterseite des Querschlitzes (26) in dem Anschlußhalter (14) einzugreifen, und die Bereiche des Anschlußstiftes aufeinander zu zwingen, wenn der Stift (30) in Längsrichtung in den Anschlußhalter (14) getrieben wird, um dadurch die Bereiche sich um den Draht (20), der sich durch den Schlitz (32) in dem Stift erstreckt, verformen und den Draht (20) greifen zu lassen.
3. Vorrichtung zur Verwendung bei der Durchführung des Verfahrens von Anspruch 1, mit einem Dorn (10) mit an voneinander beabstandeten Orten befindlichen ersten und zweiten Anschlußhaltern (14), Einrichtungen (15, 16) zum Bewegen der Anschlußhalter (14) zwischen Positionen, in denen sie in die Dornoberfläche hineingezogen sind, und Positionen, in denen sie von der Dornfläche vorragen, Einrichtungen zum Wickeln des Widerstandsheizdrahtes um den Dorn von einem der Anschlußhalter zu dem anderen, wobei die Anschlußhalter (14) gestaltet sind, um Anschlüsse an dem Heizdraht (20) gesichert zu halten und dadurch den Draht zwischen den Anschlußhaltern (14) in Spannung zu halten, Einrichtungen zum Abschneiden des Drahtes (20) an einer zu einem Anschlußhalter (14) benachbarten Position auf der von dem anderen entfernten Seite und einer Einrichtung zum Formen einer Hülle aus thermoplasti-

schem Material um den Dorn (10), die Anschlüsse (30) und die vorragenden Bereiche der Anschlußhalter (14), dadurch gekennzeichnet, daß die Anschlußhalter (14) in der Form von Pfosten vorliegen, wobei jeder eine Ausnehmung (22), die sich in den Pfosten von seinem äußeren Ende erstreckt, und einen Querschlitz (26) aufweist, der sich quer über den Pfosten und quer über die Ausnehmung (22) in dem Pfosten von dem freien Ende des Pfostens erstreckt, wobei der Schlitz (22) an einer nach außen von dem inneren Ende (24) der Ausnehmung (22) befindlichen Position endet, und worin das innere Ende (24) der Ausnehmung mit Formflächen versehen ist, die gestaltet sind, um, in Richtung der Ebene des Schlitzes (26), jeweilige Bereiche des Endes, das komplementär zu der Ausnehmung (22) und in die Ausnehmung (22) eingesetzt ist, eines Anschlusses (30) zu verformen, wenn letzterer in den Anschlußhalter (14) getrieben wird.

4. Eine Elektroschweißmuffe, die nach dem Verfahren der Ansprüche 1 oder 2 oder unter Verwendung der Vorrichtung von Anspruch 3 geformt ist.

Revendications

1. Procédé de formation d'un dispositif de couplage par électrofusion, comprenant l'utilisation d'un mandrin (10) qui comporte, en des positions longitudinales espacées, des premier et second supports de borne (14) pouvant être rétractés dans le mandrin (10), a l'intérieur de la surface périphérique de ce dernier, et pouvant être étendus vers l'extérieur hors de ladite surface périphérique, le procédé comprenant les étapes consistant à préparer une longueur continue de fil métallique (20) de chauffage électrique par effet Joule, à monter une première borne (30) dans ledit premier support de borne (14) et à fixer la première borne (30) audit fil métallique, à enrouler le fil métallique autour du mandrin (10), à partir de ladite première borne (30) et dudit premier support de borne (14), en faisant plusieurs tours, à monter une deuxième borne (30) dans le deuxième support de borne (14) et à fixer la deuxième borne (30) au fil métallique, le fil métallique étant maintenu en tension entre lesdites première et deuxième bornes (30), à couper ensuite le fil qui dépasse de ladite deuxième borne (30), à mouler autour du mandrin (10) sur lequel est enroulé le fil et autour des bornes (30) supportées par lesdits supports de borne (14), un manchon (42) en matériau thermoplastique en laissant des parties des bornes (30) accessibles sur l'extérieur du manchon (42), à laisser le matériau thermoplastique se solidifier, à faire rétracter les supports de borne (14) à l'intérieur du mandrin (10) en laissant les bornes (30) supportées par la matière plastique

et à retirer axialement le mandrin (10) du manchon (42) en laissant le fil enroulé et les bornes supportées par le manchon de matière plastique, caractérisé en ce que chacune desdites bornes (30) a une extrémité comportant une encoche (32) destinée à recevoir ledit fil métallique (20) et chacun desdits support de borne (14) forme un élément de matrice ou enclume qui comporte une cavité (22) s'étendant dans son extrémité extérieure, destinée à recevoir ladite extrémité d'une telle borne (30), le support de borne (14) comportant une encoche (26) destinée à recevoir ledit fil métallique (20) qui traverse le support de borne (14) et ladite encoche (32) formée dans ladite borne (30) engagée dans ladite cavité (22), les bornes (30) étant faites d'un métal malléable, et dans lequel l'étape de montage de chacune desdites bornes dans le support de borne correspondant et de fixation de la borne au fil métallique comprend le fait de placer le fil métallique (20) dans le support de borne (14) afin qu'il traverse ladite encoche (26) formée dans ce dernier, d'insérer la borne (30) dans ladite cavité (22) formée dans le support de borne (14) de telle sorte que ladite encoche (32) placée dans le support de borne (14) reçoive le fil métallique (20) qui traverse le support de borne (14) et le fait de pousser la borne (30) contre le support de borne (14) pour déformer le matériau de la borne (30) autour du fil métallique (20) et pincer ainsi fermement le fil métallique (20).

2. Procédé selon la revendication 1, dans lequel chacune desdites bornes (30) a la forme d'une broche dans laquelle ladite encoche (32) destinée à recevoir le fil métallique (20) s'étend longitudinalement d'une extrémité libre de celle-ci, et le fond de ladite cavité (22) formée dans le support de borne (14) est doté de surfaces de mise en forme (24) aptes à venir en contact avec les parties de ladite extrémité libre de la broche sur les deux côtés de ladite encoche, en-dessous du niveau du fond de l'encoche transversale (26) formée dans le support de borne (14), et à pousser lesdites parties de la broche formant borne l'une vers l'autre quand la broche (30) est enfoncée longitudinalement dans le support de borne (14), afin d'amener ainsi lesdites parties à se déformer autour du fil métallique (20) traversant ladite encoche (32) formée dans la broche et à pincer le fil métallique (20).
3. Appareil à utiliser pour la mise en oeuvre du procédé de la revendication 1, comprenant un mandrin (10) qui comporte, en des positions longitudinales espacées, des premier et second supports de borne (14), des moyens (15, 16) servant à déplacer lesdits supports de borne (14) entre des positions pour lesquelles ils sont rétractés à l'intérieur de la surface du mandrin et des positions pour lesquelles

ils dépassent de la surface du mandrin, des moyens servant à enrouler un fil métallique de chauffage électrique autour du mandrin, d'un support de borne à l'autre, lesdits supports de borne (14) étant capables de maintenir des bornes (30) 5
fixées audit fil métallique de chauffage (20) et de maintenir ainsi le fil métallique en tension entre les supports de borne (14), un moyen servant à sectionner le fil métallique (20) en une position adjacente à l'un desdits supports de borne (14), du côté 10
éloigné de l'autre support, et un moyen servant à mouler, autour du mandrin (10), desdites bornes (30) et des parties qui dépassent desdits supports de borne (14), un manchon de matériau thermoplastique, 15
caractérisé en ce que lesdits supports de borne (14) ont la forme de colonnes avec chacune une cavité (42) qui s'étend dans la colonne depuis son extrémité extérieure et une encoche transversale (26) qui s'étend transversalement à la colonne et à 20
la cavité (22) formée dans la colonne depuis ladite extrémité libre de la colonne, l'encoche (26) se terminant en une position située à l'extérieur de l'extrémité intérieure (24) de ladite cavité (22), et dans lequel l'extrémité intérieure (24) de ladite 25
cavité comporte des surfaces de mise en forme capables de déformer, en direction du plan de ladite encoche (26), des parties respectives de l'extrémité de ladite borne (30), complémentaires à ladite cavité (22) et insérées dans ladite cavité (22), 30
quand cette dernière est enfoncée dans ledit support de borne (14).

4. Dispositif de couplage par électrofusion formé par le procédé des revendications 1 ou 2, ou à l'aide de l'appareil de la revendication 3. 35

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Fig.1.

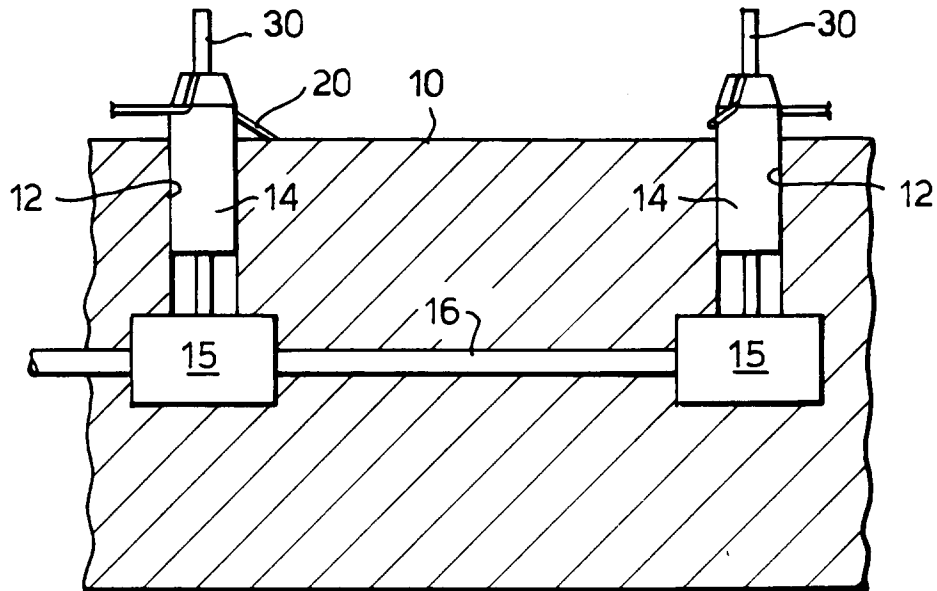


Fig.2.

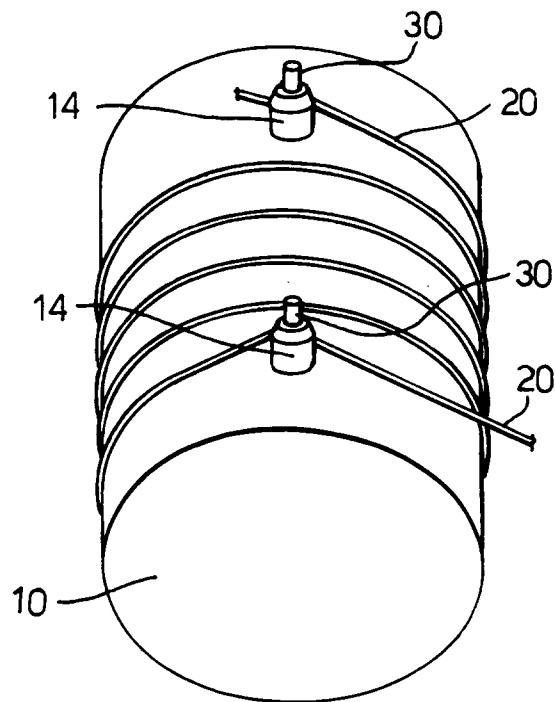


Fig.3.

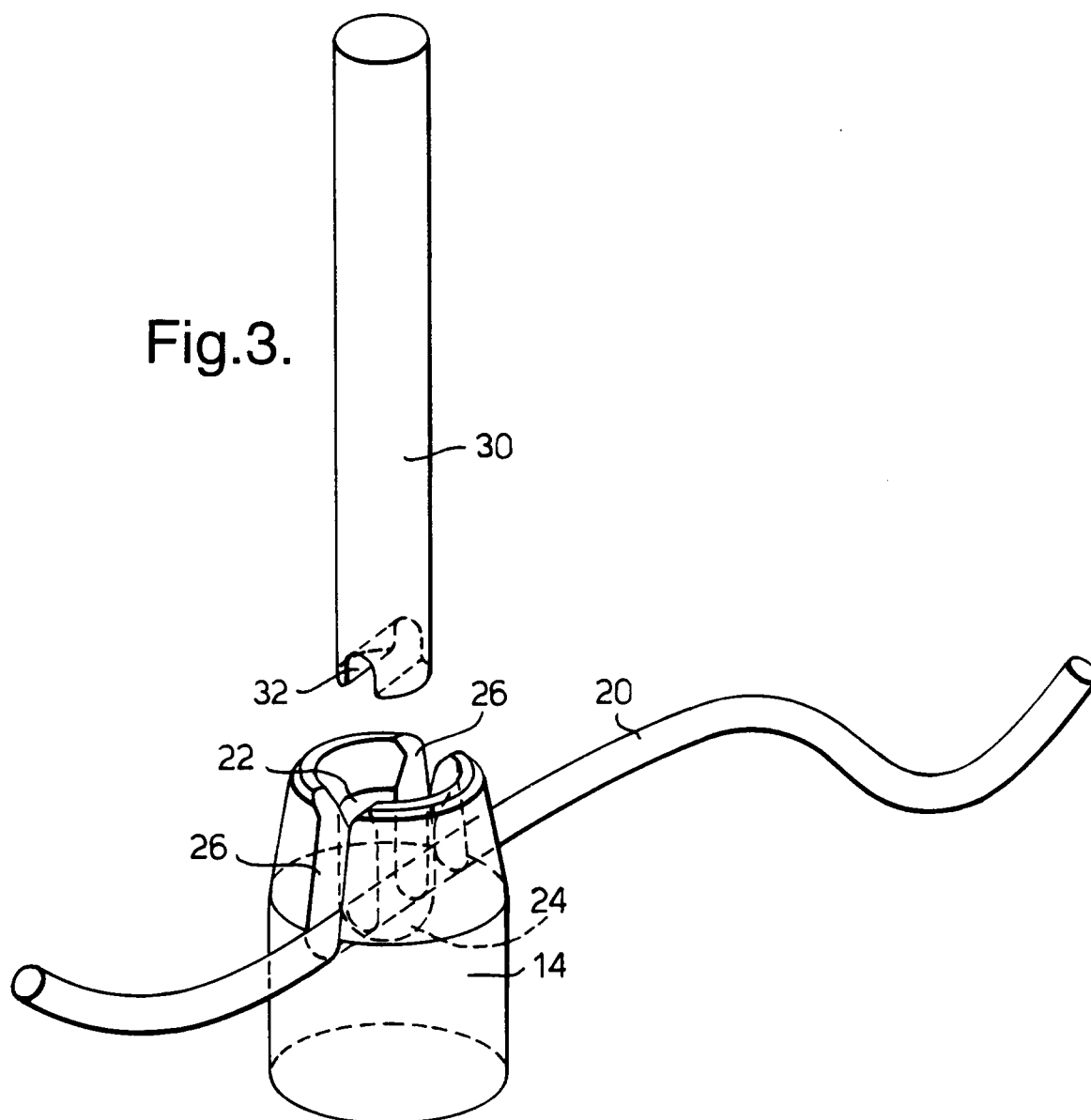


Fig.6.

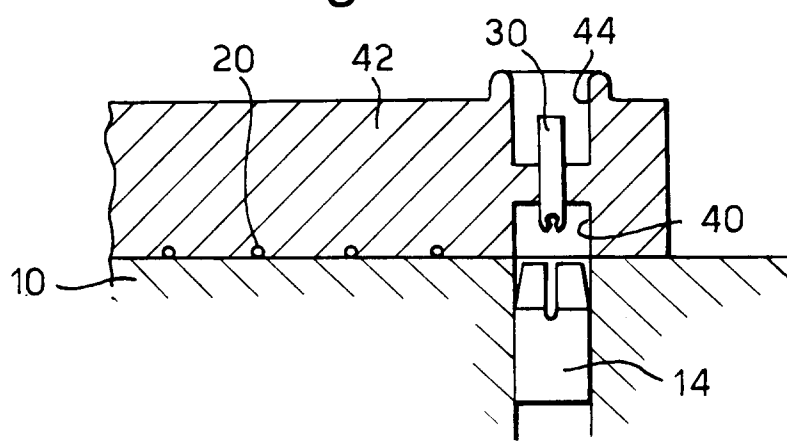


Fig.4.

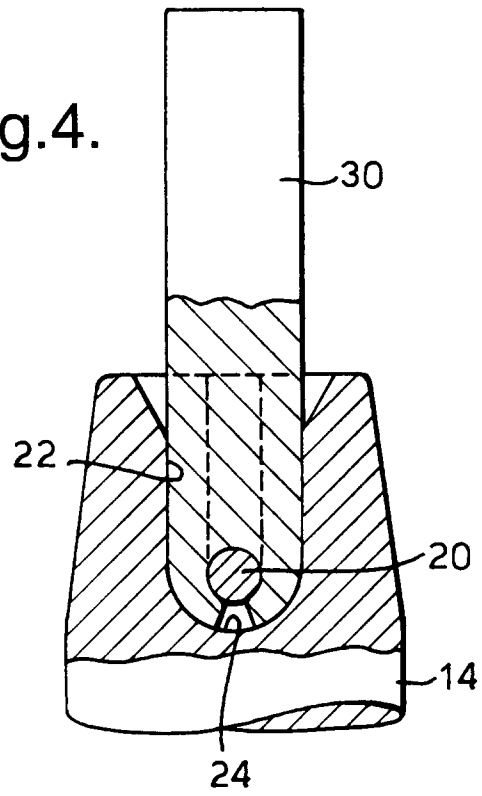


Fig.5.

